WHAT IS CLAIMED IS:

1. A III-V nitride semiconductor substrate comprising a III-V nitride semiconductor single crystal at least in a surface portion thereof, the product of [H] and [D] being $1 \times 10^{25}$ or less, wherein [H] represents the concentration of hydrogen atoms (the number of hydrogen atoms per $cm^3$) in a surface portion of said single crystal, and [D] represents a dislocation density (the number of dislocations per $cm^2$) on a single crystal surface.

2. The III-V nitride semiconductor substrate according to claim 1, wherein it is a self-supported substrate composed of a III-V nitride semiconductor single crystal.

3. The III-V nitride semiconductor substrate according to claim 1, wherein said III-V nitride semiconductor single crystal is hexagonal gallium nitride.

4. The III-V nitride semiconductor substrate according to claim 3, whose substrate surface is a C-plane, on which a group III element appears.

5. The III-V nitride semiconductor substrate according to claim 1, wherein a surface of said substrate is mirror-polished.

6. The III-V nitride semiconductor substrate according to claim 1, wherein a surface of said substrate has an arithmetic average roughness Ra of 10 nm or less.

7. A production lot of plural III-V nitride semiconductor substrates, wherein all substrates in said production lot are III-V nitride semiconductor substrates each comprising a III-V nitride semiconductor single crystal at least in a surface portion thereof, the product of [H] and [D] being $1 \times 10^{25}$ or less, wherein [H] represents the concentration of hydrogen atoms (the number of hydrogen atoms per $cm^3$) in a surface portion of said single crystal, and [D] represents a dislocation density (the number of dislocations per $cm^2$) on a single crystal surface.

8. A III-V nitride semiconductor device comprising an epitaxial layer of a

III-V nitride semiconductor crystal formed on a III-V nitride semiconductor substrate comprising a III-V nitride semiconductor single crystal at least in a surface portion thereof, the product of [H] and [D] being $1 \times 10^{25}$ or less, wherein [H] represents the concentration of hydrogen atoms (the number of hydrogen atoms per $cm^3$) in a surface portion of said single crystal, and [D] represents a dislocation density (the number of dislocations per $cm^2$) on a single crystal surface.

9. A method for producing a III-V nitride semiconductor device comprising (a) thermally treating a III-V nitride semiconductor substrate at a temperature of 1200°C or lower in a mixed gas of hydrogen and ammonia, and then (b) epitaxially growing a III-V nitride semiconductor crystal on said III-V nitride semiconductor substrate, said III-V nitride semiconductor substrate comprising a III-V nitride semiconductor single crystal at least in a surface portion thereof, the product of [H] and [D] being $1 \times 10^{25}$ or less, wherein [H] represents the concentration of hydrogen atoms (the number of hydrogen atoms per $cm^3$) in a surface portion of said single crystal, and [D] represents a dislocation density (the number of dislocations per $cm^2$) on a single crystal surface.

10. The method for producing a III-V nitride semiconductor device according to claim 9, wherein the III-V nitride semiconductor device is produced by epitaxially growing a III-V nitride semiconductor crystal under the same conditions on each III-V nitride semiconductor substrate in a production lot of plural III-V nitride semiconductor substrates.